A REVISION OF THE GENUS GEOMYDOECUS (MALLOPHAGA: TRICHODECTIDAE) OF THE NEW WORLD POCKET GOPHERS (RODENTIA: GEOMYIDAE)

By Roger D. Price and K. C. Emerson

Abstract: A study of over 3800 adult specimens of Geomydocus, representing material from over 3/4 of the recognized species of pocket gophers, has resulted in the redescription of the 11 previously-described Geomydocus species as well as the description of 31 new species and 3 new subspecies. Keys are provided for the identification of these forms.

The genus Geomydocus Ewing, 1929 represents a group of trichodicid mallophagans restricted in its distribution to pocket gophers, a family of rodents limited to areas of North and Central America. To date, 11 specific names have been applied to these lice, with a number of these poorly-defined and host-limits nebulous at best. Through the cooperation of various individuals, we have been able to examine over 3800 adult Geomydocus from 29 of the 36 species, and many subspecies, of pocket gophers recognized by Russell (1968). This undoubtedly represents the most extensive collection of Geomydocus assembled for study. It soon became apparent to us that we would not only be able to redescribe the existing recognized species but that we were in possession of a large number of undescribed species and subspecies. It is our intent here to present the results of this work.

In the following descriptions, measurements are in millimeters. Host nomenclature follows that of Russell (1968), Hall & Kelson (1959), or Miller & Kellogg (1955). All illustrations of similar parts are at the same magnification, so that obvious size differences are observable; unless stated to the contrary, figures represent material from the type-host. To keep descriptions as brief as possible, figures are often referred to, with a minimum of amplification; a discussion of pertinent characters precedes the descriptions to make this brevity meaningful. A number in parentheses following a locality in the materials examined section refers to total different collections. Designation of paratypes is restricted to specimens from the type-host. The species and subspecies are numbered from 1–18 to indicate a grouping, so that those with the same number followed by a letter are presumed to belong to the same group and those with a number and no letter remain ungrouped.

Data on questionable records are given even though we doubt the accuracy of the data. Inaccuracies probably resulted from one or more of the following reasons: (1) host identifications were made by many individuals, and it is doubtful that they all agree on interpretation of the classification; (2) some of the material was collected off museum skins, thus leading to suspected contamination; (3) more than one species of pocket gopher may be found in some localities, especially in Mexico, and this offers the opportunity for mixing of specimens in the field during preparation of the skins; and (4) during preparation of the material for study, there was opportunity for mixing of louse specimens or for the erroneous transfer of data to the slides. The percentage of questionable records is about what we have experienced in other studies.

The accompanying figures give the geographical distributions of the 45 recognized Geomydocus taxa. The number in parentheses after each name corresponds to the group number associated with each description. In most instances, the distribution shown for the Geomydocus is roughly equivalent to the range of the known host species or subspecies based on maps of Hall & Kelson (1959). Table 1 summarizes the occurrence of Geomydocus on the various hosts; vertical lines with arrows indicate the presence of a single Geomydocus taxon on more than one host taxon; a bracket is used to indicate the occurrence of usually only one, less often 2, Geomydocus on the same host taxon. Questionable records have been omitted from both the maps and table.

Genus GEOMYDOECUS Ewing, 1929


5. Much as in fig. 1. Head with medioanterior indentation; preantral region as broad as or broader than temples. Antenna with scape very large, remaining 2 segments slender. Pterothorax with varying number of medium to long setae; prothoracic legs smallest, usually beneath head; legs with single claw. Abdomen broadly rounded, without evident spiracles. Single row of setae on tergites I–VIII and sternites II–VII.
| TABLE 1. Host-parasite associations of pocket gophers and Geomydceus. |
|-----------------------------|-----------------------------|-----------------------------|
| **Pocket Gophers**          | **Geomydceus sp.**          |                             |
| **Family Geomyidae**        |                             |                             |
| Tribe Thomomynini           |                             |                             |
| Genus Thomomynys            |                             |                             |
| umbrius atrocarinus         |                             |                             |
| crassidens                  | umbrini (3b)                |                             |
| durangi                      |                             |                             |
| eximius                     |                             |                             |
| parviceps                   |                             |                             |
| zacateceae                  |                             |                             |
| tolucae                      | tolucae (7c)                |                             |
| neocopei (8b)               |                             |                             |
| bottae analogus             |                             |                             |
| cinerae                      |                             |                             |
| bottae                      |                             |                             |
| chrysoeolus                  | californicus (3a)           |                             |
| robinus                      |                             |                             |
| sinaeae                      |                             |                             |
| persusus                     |                             |                             |
| [baileyi] talarosae         |                             |                             |
| simius                      |                             |                             |
| perditus                     |                             |                             |
| bulbivorous                  |                             |                             |
| toensendii elkoensis        | idahoensis (7b)             |                             |
| nevadesi                     |                             |                             |
| toensendii                  |                             |                             |
| talpoides coninus           | dakotensis (6b)             |                             |
| rufescens                    |                             |                             |
| uinta (?                      |                             |                             |
| nebulosus                    |                             |                             |
| bullatus                     |                             |                             |
| clatius                      |                             |                             |
| fossor                      |                             |                             |
| macrotis                    |                             |                             |
| ocirus                       |                             |                             |
| agrestis                     |                             |                             |
| deovexus                    |                             |                             |
| douglasii                   |                             |                             |
| fusius                      |                             |                             |
| pygmeaus                    |                             |                             |
| quadriatus                  |                             |                             |
| raus                        |                             |                             |
| talpoides                   |                             |                             |
| wastechensis                |                             |                             |
| monticola hesperus          |                             |                             |
| mazama glacialis            |                             |                             |
| tamuli                      |                             |                             |
| Tribe Geomyini              |                             |                             |
| Genus Zygogeomys            |                             |                             |
| trichopus trichopus         |                             |                             |
| Genus Geomys                |                             |                             |
| tropicalis                  |                             |                             |
| personatus fallax           |                             |                             |
| megalotanus                  |                             |                             |
| personatus                  |                             |                             |
| strekleri                   |                             |                             |
| arenarius arenarius         |                             |                             |
| brevirostris                |                             |                             |
| bursarius breviceps          |                             |                             |
| pratincola                  |                             |                             |
| dutyleri                    |                             |                             |
| major                       |                             |                             |
| alvateri                    |                             |                             |
| industria                   |                             |                             |
| brazensis                   |                             |                             |
| bursarius latezensis        |                             |                             |
| majuscusculus               |                             |                             |
| illinoisis                  |                             |                             |
| { illinoisis (2c)           |                             |                             |
| { australis                  |                             |                             |
| floridanus                  |                             |                             |
| gaffi                        |                             |                             |
| mobilenis                   |                             |                             |
| pinetis                     |                             |                             |
| colonus                     |                             |                             |
| cumberlandicus              |                             |                             |
| fontanalus                  |                             |                             |
| Genus Orthogeomys           |                             |                             |
| grandis alleni              |                             |                             |
| felipensis                   |                             |                             |
| hispidus chiapensis          |                             |                             |
| chapienis (11)              |                             |                             |
| torridus                    |                             |                             |
| yuatanensis                 |                             |                             |
| Genus Macrogomys            |                             |                             |
| heterodus cartagoensis       |                             |                             |
| catator                      |                             |                             |
| dariesis                    |                             |                             |
| Genus Pappogeomys            |                             |                             |
| alicorni                     |                             |                             |
| bulleri burti                |                             |                             |
| bulleri                      |                             |                             |
| melanurus                   |                             |                             |
| nelsoni                     |                             |                             |
| famorus                      |                             |                             |
| gymnurus gymnurus            |                             |                             |
| russell                      |                             |                             |
| castanops castanops          |                             |                             |
| lacrimalis                   |                             |                             |
| rubellus                    |                             |                             |
| merriami estor              |                             |                             |
| perotensis                  |                             |                             |
| { oregonus (7a)              |                             |                             |
| { duchesnensis (6c)          |                             |                             |
| { ward (8c)                  |                             |                             |
| { thomomynus (6a)            |                             |                             |
| { trichopi (14)              |                             |                             |
| { texanus (4)                |                             |                             |
| { truncatus (5)              |                             |                             |
| { quadrotatus (3c)           |                             |                             |
| { exingi (2d)                |                             |                             |
| { oklahomensis (3e)          |                             |                             |
| { subgeoymdis (2g)           |                             |                             |
| { geoymdis (2a)              |                             |                             |
| Pleurites II–IV or II–V well-developed, with setae. Genitalia (Fig. 100) consisting of a medioposterior endoneral plate, a fused parameral arch, a sac, and basal apodemes. ♀. Much as in Fig. 2. Close to ♀, except as follows. Head broadest across temples. Antenna 3-segmented (Fig. 146), with basal and terminal segments small, second segment often with process, although often obscured by angle of mouth. Pterothorax with varying number of long setae. Ventral terminalia variable, with subgenital plate and conspicuous gonopophyses. **CHARACTERS**

♀: (1) The scape occurs in 3 types: (a) with a distinct protuberance on the posterior margin (Fig. 143), (b) with a tendency for a much less developed convexity on the posterior margin (Fig. 144), and (c) with the posterior margin essentially straight (Fig. 145). The first is clearly separable from the others, but the position of the antenna and variability in mounting sometimes makes decisions between types (b) and (c) difficult. Type (b) is restricted to certain specimens from Geomydus bursarius (Shaw), and a note to this effect is inserted in the
key.

(2) The posterior margin of the temple has setae that have proven valuable in \( \varphi \) identification. All specimens have 3 setae associated with the lateroposterior corner, one of these usually submargmal and the other 2 marginal. Of particular significance are whether the 2 marginal setae are stout and spiniform (Fig. 41-47) or slender (Fig. 48-51), and the position and length of the submarginal seta in relation to the 2 marginal setae. The various types observed are shown in Fig. 41-51.

(3) Certain general impressions are associated with the shape and chaetotaxy of the abdomen, especially of the terminalia. The tergoventral setae may be short (not extending over halfway from their alveoli to those on the following tergite), long (extending to or beyond alveoli on following tergite), or medium (intermediate between these). Also, certain peculiarities are present involving unusual chaetotaxy (Fig. 5) or unusual gross abdominal shape (Fig. 5, 17).

(4) Probably the single most useful feature for species recognition involves the details of the genitalia. Mediodioposteriorly there is a single plate, here referred to as the endosomal plate, that assumes a wide variety of shapes, from being widely bifurcate (Fig. 134), narrowly divided (Fig. 133), pointed and undivided (Fig. 120), to elongate and undivided (Fig. 124). Passing laterally across the endosomal plate area is another sclerite of uncertain origin, possibly representing the fused parameres, and here termed the parameral arch; this may assume an evenly rounded shape (Fig. 142), an expanded truncate shape (Fig. 121), a flared posterior portion with a nipple-like projection (Fig. 122), a medio-posterior projection (Fig. 100), to having an elongate attenuate shape (Fig. 127). The genital sac may be small and possess no obvious large pigmented spines (Fig. 127), may be somewhat larger and have 2 spines (Fig. 138), may be well-developed and have 4 spines (Fig. 100), 6 spines (Fig. 119), or 10-11 spines (Fig. 137), or may even have a more exotic spination (Fig. 114, 117, 118).

(5) Useful dimensions are those of head width (HW) across the temples, total body length (TBL) at the midline, and genitalia width (GW) measured as the broadest area across the parameral arch.

\( \varphi \). (1) The gross shape and relative size of the head are given in a series of head outlines (Fig. 29-40), useful more for comparative purposes than for identification of an individual species.

(2) The posterior margin of the temple has 3 setae in a position comparable to the \( \varphi \). No \( \varphi \) possesses marginal spiniform setae, but the relative lengths and positions of these 3 setae do enable a degree of grouping and may also allow \( \varphi \) to be correctly associated with \( \varphi \) in instances in which 2 species of Geomydocus occur on the same host.

(3) The last tergite typically has 3 setae each side, either grouped together at the lateroposterior corner (Fig. 73) or with one seta displaced toward the midline (Fig. 76). This positioning, along with the lengths of these setae, has been found most useful in classification of the \( \varphi \).

(4) The chaetotaxy of the subgenital plate has also proven to be of significance for species identification. It may have a medioanterior patch of long setae (Fig. 16), a sparse number of long medioanterior setae (Fig. 24), or only a lateral patch (Fig. 26). This lateral patch of setae may consist of 1 seta longer and stouter than the others (Fig. 6, 10) or of a number of subequally long setae (Fig. 24, 25). The plate itself may be rather long and lobate, reaching the end of the abdomen (Fig. 2, 16), or it may be broad and U-shaped with short setae ending far from end of abdomen (Fig. 8), or it may be broad with transversely aligned setae (Fig. 12), or it may be the more conventional plate (Fig. 10, 13, 19, 21, 26, 28).

(5) A particulation is evident in the genital chamber of virtually all specimens, this being especially pertinent in the lateral region. These particles may be (a) regularly narrow and oblong (Fig. 62), (b) oblong but with a series of definite dark dots on each (Fig. 63), (c) rather large with a posterior fringe of spinules (Fig. 64), (d) slender anteriorly and broader posteriorly, without fringes (Fig. 65), or (e) as in type of Fig. 65, but with a fringe of spinules on posterior particles (Fig. 66). Differentiation between types (d) and (e) is subject to some difficulties, but the other types are excellent for rapid recognition of species groups.

(6) One of the most valuable and consistent features for \( \varphi \) identification concerns the structure of what appears to be the dorsal wall of the genital chamber. This membrane, or sac, has a series of lines associated with it, assuming various configurations (Fig. 80-99). The overall size of this sac, along with the location and direction of the lines, is of importance. There may be (a) a number of anterior loops (Fig. 93), (b) only a few anterior loops (Fig. 94), (c) all converging lines (Fig. 91), (d) only lateral lines (Fig. 83), (e) anterior papillosity (Fig. 89), (f) a medioanterior indentation (Fig. 99), and so on, all of which have proven to be quite consistent and reliable.

(7) The only dimensions of use for the \( \varphi \) are
those of head width (HW) across the temples, total body length (TBL) at the midline, and genital chamber width (GCW) measured anteriorly between bases of lateral constrictions.

**KEY TO THE KNOWN SPECIES AND SUBSPECIES OF Geomyodes**

\[ \begin{align*}
1. & \text{Scape with definite process on posterior margin (FIG. 143)} & \Rightarrow \text{quadridentatus} & (p. 240) \\
2. & \text{Genital sac with only 4 large spines (FIG. 106)} & \Rightarrow \text{omohemis} & (p. 242) \\
3. & \text{Temple with submarginal seta about } 2 \times \text{length of longer corner marginal spiniform seta; head width } 0.39 \text{ or less} & \Rightarrow \text{californicus} & (p. 238) \\
4. & \text{Temple with submarginal seta } 2 \times \text{or more length of longer corner marginal spiniform seta} & \Rightarrow \text{oklahomensis} & (in part) (p. 242) \\
5. & \text{Temple without marginal spiniform setae each side (FIG. 48–51)} & \Rightarrow \text{umbrini} & (p. 240) \\
6. & \text{Temple with } 1–2 \text{ marginal spiniform setae each side (FIG. 41–47)} & \Rightarrow \text{yucatanensis} & (p. 249) \\
7. & \text{Temple margin with very long seta (FIG. 51); genitalia of type in FIG. 114} & \Rightarrow \text{dakotensis} & (p. 243) \\
8. & \text{Genitalia (FIG. 112) with not more than single spinous piece in sac and width only } 0.11–0.12 & \Rightarrow \text{fulvescens} & (p. 256) \\
9. & \text{Genitalia (FIG. 114) with at least 3 spinous pieces in sac (FIG. 114, 117, 118) and width 0.13 or more} & \Rightarrow \text{trubi} & (p. 257) \\
10. & \text{Genitalia (FIG. 100) with } 4–5 \text{ short spinous pieces in addition to 2 elongate pieces (FIG. 117, 118); peronotus (p. 243)} & \Rightarrow \text{chilensis (p. 251)} \\
11. & \text{Genitalia (FIG. 100, 102) large, over } 0.20 \text{ wide, head width over } 0.60 & \Rightarrow \text{corniculata (p. 251)} \\
12. & \text{Genitalia (FIG. 130) very narrow, } 0.06–0.07 \text{ wide; head width approximately } 0.55\ldots & \Rightarrow \text{dariensis (p. 251)} \\
13. & \text{Genitalia (FIG. 102) only } 0.21 \text{ wide, with endomeral plate as shown; genitalia as in FIG. 122 (p. 249)} \\
14. & \text{Genitalia with flattened medioposterior margin of parameral arch (FIG. 121); truncatus (p. 242)} \\
15. & \text{Genitalia (FIG. 140, 142) with evenly rounded parameral arch, endomeral plate as in FIG. 140–142; and nescen} & \Rightarrow \text{corniculata (p. 251)} \\
16. & \text{Median setae of tergites II–VII not ending more than } 0.13 \text{ from margin of respective tergite (FIG. 1)} & \Rightarrow \text{mexicanus (p. 256)} \\
17. & \text{Head width } 0.44 \text{ or less; peronotus (p. 256)} \\
18. & \text{Genitalia (FIG. 127, 138) not over } 0.14 \text{ wide, and sac either small without large spines or with } 2 \text{ spines (FIG. 138)} & \Rightarrow \text{trubi} & (p. 257) \\
19. & \text{Genitalia otherwise, often over } 0.14 \text{ wide and or sac with at least } 4 \text{ well-developed spines} & \Rightarrow \text{yucatanensis} & (p. 249) \\
20. & \text{Genitalia with broad endomeral plate having convex sides (FIG. 125); head width under } 0.50 & \Rightarrow \text{umbrini} & (p. 240) \\
21. & \text{Genitalia with narrow endomeral plate having relatively straight sides (FIG. 128, 129); head width over } 0.52 & \Rightarrow \text{fulvescens} & (p. 256) \\
22. & \text{Genitalia (FIG. 139) up to } 0.10 \text{ wide, sac within large spines, and posterior sclerites as shown; genitalia (FIG. 138, 139) with anterior spines, and posterior sclerites as shown; genitalia (FIG. 119 with endomeral plate subtriangular and undivided at tip} & \Rightarrow \text{dariensis (p. 251)} \\
23. & \text{Medioanterior head margin deeply indented (FIG. 30); genitalia (FIG. 107, 119) over } 0.21 \text{ wide} & \Rightarrow \text{dariensis (p. 251)} \\
24. & \text{Genitalia (FIG. 134) with broadly bifurcate endomeral plate and sac with } 4 \text{ large spines; genitalia (FIG. 134) with narrowly bifurcate or undivided endomeral plate of various other shapes, and often with } 6 \text{ or more prominent spines on sac} & \Rightarrow \text{corniculata (p. 251)} \\
25. & \text{Genitalia (FIG. 119 with endomeral plate much as in FIG. 109–111, usually with short apical division} & \Rightarrow \text{corniculata (p. 251)} \\
26. & \text{Genitalia with short endomeral plate shaped otherwise, either apically undivided or with deeper division} & \Rightarrow \text{corniculata (p. 251)} \\
27. & \text{Genitalia (FIG. 110, except only about } 0.16 \text{ wide, endomeral plate usually without distinct apical shoulders, and parameral arch with deeply notched anterior border (FIG. 111).} & \Rightarrow \text{corniculata (p. 251)}
28. Genital sac with 6 prominent spines; endomeral plate usually appearing undivided (FIG. 109).........................wernecki (p. 253)
Genital sac with only 5 prominent spines; endomeral plate apically divided (FIG. 110)...............mcgregori (p. 253)
29. Genital sac with only 4 large spines (FIG. 103, 106)..............30
Genital sac with 6 or more large spines.............................................31
30. Head width 0.42 or more; genitalia width 0.16 or more (FIG. 103); temple close to FIG. 43, with submarginal seta occasionally extending slightly beyond apices of marginal spiniform setae........txtanus (p. 242)
Head width 0.41 or less; genitalia close to FIG. 135, only 0.15 or less wide; temple close to FIG. 42, with submarginal seta extending well beyond apices of marginal spiniform setae...........ewingi (p. 238)
31. Endomeral plate of genitalia without evidence of apical division (FIG. 120, 123).................................32
Endomeral plate of genitalia with evident apical division..........................................................33
32. Endomeral plate subtriangular, with apical point (FIG. 120)..............................trichopi (p. 253)
Endomeral plate with blunt narrow apical prolongation (FIG. 123)..........................bulleri (p. 253)
33. Genital sac with 10–11 large spines (FIG. 137)...........................polydentatus (p. 253)
Genital sac with only 6 large spines.........................................................34
34. Scape often as in FIG. 144, with definite posterior subapical convexity; on Geomyus busarius...........35
Scape (FIG. 145) with posterior margin essentially straight; on Thomys or Pappogeomys.................36
35. Head width 0.39 or less; genitalia width 0.14 or less; total body length 1.20 or less..........................36
Head width 0.40 or more; genitalia width 0.15 or more; total body length 1.25 or more...................37
..................geometrydis subgeometrydis (p. 236)
..................illinoensis (p. 236)
36. Endomeral plate of genitalia with distinctly narrowed apical portion (FIG. 135), total body length under 1.35, and genitalia width 0.15 or less..coronadoi (p. 254)
Endomeral plate of genitalia usually without such narrowed apical portion (FIG. 105, 108, 133) or total body length over 1.35 or genitalia width 0.16 or more..........................37
Genitalia as in FIG. 122 or 133; temple (FIG. 42) with long submarginal corner seta..............................38
Genitalia closer to FIG. 105, 108, or 136; temple (FIG. 43) with shorter submarginal corner seta.............39
Genitalia (FIG. 122) with broadly flared posterior portion of parameral arch and with narrow parallel-sided apical portion of endomeral plate.tolcaec (p. 243)
Genitalia much as in FIG. 133, with narrower posterior portion of parameral arch and without such narrow apical portion of endomeral plate.................................39
39. Head width 0.43 or more; genitalia width 0.16 or more.........................................................oregonus oregonus (p. 243)
Head width 0.42 or less; genitalia width 0.16 or less.........................................................oregonus idahoensis (p. 245)
40. Genitalia close to FIG. 108, width 0.15 or less..............................expansus (p. 254)
Genitalia close to FIG. 105 or 136, width 0.16 or more................41
41. Total body length more than 1.35; genitalia close to FIG. 136, but with parameral arch not always so evenly rounded as shown...........................merriami (p. 255)
Total body length less than 1.35; genitalia close to FIG. 103,.................................................vercruzuensis (p. 255)
1. Last tergite with pair of medioanterior setae, separated from paired lateroanterior setae each side (FIG. 74–77).................................2
Last tergite without medioanterior setae, with 3 fairly evenly-spaced lateroanterior setae each side (FIG. 67–73)..............................12
2. Medioanterior setae of last tergite much shorter and finer than lateroanterior setae (FIG. 75).........traubi (p. 257)
Medioanterior setae of last tergite nearer to same size as lateroanterior setae (FIG. 74, 76, 77)...........3
3. Genital chamber sac large, with papillose anterior portion (FIG. 88, 89)........................................4
Genital chamber sac variable, but without papillose anterior portion............................................5
4. Head width more than 0.50; genital chamber sac (FIG. 89) with medial lines directed more or less posteriorly........................................................mcgregori (p. 253)
wernecki (p. 253)
Head width less than 0.50; genital chamber sac (FIG. 88) with number of loops or lines transversely across median portion..................alcorni (p. 254)
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Temple margin (FIG. 53) with long submarginal seta or (FIG. 61) with very long marginal to slightly submarginal seta........................................7
6. Genital chamber sac (FIG. 85) apparently with paired parallel lines..............wardi (p. 248)
Genital chamber sac without evident lines..................................................4ecopi (p. 248)
minor (p. 249)
7. Head width 0.43 or less and temple margin with very long seta (FIG. 61)...........................................8
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thomomyus (p. 242)
Genital chamber sac without evident lines......................................................................9
..............................duchesensis (p. 243)
9. Subgenital plate without medioanterior setae (FIG. 10); genital chamber sac as in FIG. 86 or 98..10
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11. Head width 0.48 or less..................perotensis perotensis (p. 256)
Head width 0.49 or more..................perotensis ilonis (p. 256)
fuscaenis (in part) (p. 256)
fuscaenis (in part) (p. 256)
12. Genital chamber sac very large, usually at least 0.30 wide anteriorly, and with predominantly posteriorly converging lines, with few, if any, complete anterior loops (FIG. 82, 90, 95, 97, 99)..................13
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13. Anterior margin of genital chamber sac with definite median indentation or concavity (FIG. 92, 99)........... 14
Anterior margin of genital chamber sac even flat to rounded ........................................ 16
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16. Genital chamber sac as in FIG. 95; last tergite with variable short and medium setae close to FIG. 70 or 72.......... polystyliatus (p. 235)
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17. Head width less than 0.50........................................... 18
Head width more than 0.60........................................... 19
18. Genital chamber sac (FIG. 82) with irregular lines in central area forming at most 3–5 coarse loops...........(238)
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Genital chamber sac (FIG. 97) with all lines fairly regular and directed posteriorly......... tolucae (in part) (p. 245)
19. Temple setae (FIG. 60) with distance between submarginal setae and innermost short marginal corner seta greater than that between 2 short marginal corner setae..................... chiapensis (in part) (p. 251)
alli (p. 249)
Temple setae (FIG. 49) with submarginal seta usually closer to innermost short marginal corner seta than distance between 2 short marginal corner setae.......................... jones (p. 249)
20. Lateroposterior setae of last tergite all short, none extending close to posterior margin of abdomen (FIG. 70, 71)...................... 21
Some to all lateroposterior setae of last tergite longer, extending at least to posterior margin of abdomen... 23
21. Genital chamber sac close to FIG. 94, with few complete anterior loops; subgenital plate with medioanterior patch of long setae (FIG. 16). coronadoi (p. 254)
Genital chamber sac close to FIG. 93, with numerous complete anterior loops; subgenital plate with few to no long medioanterior setae (FIG. 10, 24)...................... 22
22. Lateroposterior setae of last tergite with outer seta shortest (FIG. 70); subgenital plate setae (FIG. 6) with I setae each side longer and stouter than others.......................... veracruzensis (p. 235)
Lateroposterior setae of last tergite variably subequal and short (FIG. 71); subgenital plate setae (FIG. 25) with number of subequal long setae each side...................... 23
merriami (p. 255)
23. Temple setae (FIG. 60) with submarginal seta of both sides distinctly mediad to innermost short marginal corner seta............. 24
Temple setae with submarginal seta on either or both sides not distinctly mediad to innermost marginal corner seta.................. 27
24. Head width over 0.63; genital chamber sac (FIG. 90) over 0.25 wide anteriorly.. chiapensis (in part) (p. 251)
Head width 0.64 or less; genital chamber sac (FIG. 91, 96) not over 0.25 wide anteriorly.................. 25
25. No central setae on tergite VII extending entirely across tergite VII; median pair of setae on tergite VII long, extending beyond margin of tergite VII; genital chamber sac as in FIG. 91............. okei (p. 245)
Some central setae on tergite VII long, extending en-
tirely across tergite VIII; median pair of setae on tergite VIII short, not extending beyond margin of tergite VIII; genital chamber sac as in FIG. 96........................................... 26
26. Head width 0.60 or more.. chapini (p. 249)
Head width 0.59 or less........ yucatanensis (p. 249)
27. Setae across central 1/3 of tergite VII distinctly longer than comparable setae on tergite VI and subgenital plate lacking medioanterior patch of long setae........... 28
Setae across center of tergite VII either not distinctly longer than comparable setae on tergite VI, or, if longer, then subgenital plate with medioanterior patch of long setae........................................... 32
28. Lateroposterior setae of last tergite with outer seta much shorter than others (FIG. 69) and genital chamber sac as in FIG. 93............. expansus (p. 254)
Lateroposterior setae of last tergite all essentially of same length (FIG. 67, 73) or outer slightly shorter, or, if much shorter, then genital chamber sac as in FIG. 92 and head width over 0.50........................ 29
29. Head width 0.56 or more.. costaricensis (in part) (p. 251)
Head width 0.52 or less........................................... 30
30. Head width 0.45 or more; genital chamber sac as in FIG. 94.................... texanus (p. 242)
Head width 0.44 or less; genital chamber sac (FIG. 81, 84) often faintly lined...................... 31
31. Temple with submarginal seta from midway between corner marginal setae (FIG. 59) to being closer to inner seta (FIG. 58); genital chamber sac as in FIG. 81, but with faint lines............. selerius (p. 236)
Temple with submarginal seta closer to outer corner marginal seta (FIG. 37); genital chamber sac as in FIG. 84, with distinct diagonal lines.......................... truncatus (p. 242)
32. Lateroposterior setae of last tergite with inner seta much shorter than others (FIG. 68); genital chamber sac as in FIG. 87, with faint lines.. mexicanus (p. 256)
Lateroposterior setae of last tergite with inner seta essentially same length as adjacent seta (FIG. 69, 73); genital chamber sac nearer to FIG. 82, 93, 94, 97.......... 33
33. Genital chamber sac (FIG. 82, 97) with either irregular lines and at most 3–5 coarse loops or regular lines all directed posteriorly................................................................. 34
Genital chamber sac close to FIG. 93 or 94, with fairly smooth lines and regular loops.............. 35
34. Genital chamber sac (FIG. 82) with irregular lines in central area forming at most 3–5 coarse loops........ iliinoensis (in part) (p. 238)
Genital chamber sac (FIG. 97) with all lines fairly regular and directed posteriorly.......................... tolucae (in part) (p. 245)
35. Genital chamber sac (FIG. 94) with only up to 4 anterior loops........................................... 36
Genital chamber sac (FIG. 93) with 5 or more anterior loops...................... 38
36. Temple with submarginal seta extending beyond apex of longer adjacent corner marginal seta (FIG. 52)........... ewingi (part) (p. 238)
geomydis subgeomydis (in part) (p. 236)
Temple with submarginal seta not extending beyond apex of longer adjacent corner marginal seta (FIG. 54)................................................................. 37
37. Head width 0.41 or less.............. geomydis subgeomydis (in part) (p. 236)
Head width 0.42 or more.. quadridentatus (p. 240)
oklahomaensis (p. 242)
38. Temple with submarginal seta not longer than longest adjacent corner marginal seta (FIG. 34)...................... 39
Temple with submarginal seta longer than longest
adjacent corner marginal seta (FIG. 52).......... 39.

Head width 0.42 or more; genital chamber sac with
5-12 or more anterior loops........................................

**geomydis geomydis** (in part) (p. 236)

_head width 0.41 or less; genital chamber sac with only
up to 6 or so anterior loops........................................

**geomydis subgeomydis** (in part) (p. 236)

40. Head width 0.47 or more........................................

**geomydis geomydis** (in part) (p. 236)

<o>oregonus oregonus** (p. 243)

Head width 0.46 or less........................................

41. Head width 0.43 or less........................................

**geomydis subgeomydis** (in part) (p. 236)

<o>oregonus idahoensis** (in part) (p. 245)

<o>californicus** (p. 238)

<o>ewingi** (in part) (p. 238)

Head width 0.44-0.46........................................

**geomydis geomydis** (in part) (p. 236)

<o>oregonus idahoensis** (in part) (p. 245)

<o>subcalifornicus** (p. 240)

<o>ewingi** (in part) (p. 238)

1. **Geomydoecus scleritus** (McGregor) FIG. 38, 58, 81

Amer. 10: 172. Type-host: *Geomys pinetis
floridanus* (Audubon & Bachman).

♀ Unknown.

♂ HW 0.40-0.44, usually as in FIG. 38, less often 37; temple
usually as in FIG. 38, with short submarginal seta near inner
marginal corner seta, but occasionally submarginal seta more
lateral (FIG. 59). Last tergite as in FIG. 73. Subgenital plate
close to FIG. 10; tergoentral setae on VII longer than those on
VI. TBL. 1.06-1.20. Genital chamber particles as in FIG. 66;
genital chamber sac (FIG. 81) with faint lines.

To our knowledge, this species is unique in that
no ♀♂ have ever been collected. They either do not exist and the ♀♀ reproduce by parthenogenesis
or else the ♀♂ exist in such a small percentage as
to have escaped capture thus far; we have seen
over 300 ♀♀ and many nymphs representing collections
from all 4 species and all subspecies of southeastern
U.S.A. pocket gophers (FIG. 147), but no ♀♂. The ♀ appears closest to *G. truncatus* Werneck,
but the position of the submarginal temple seta, the lines of the genital chamber sac, and the
small size distinguish it from this as well as other
species. The absence of ♀♂ handicaps further speculation on relationships.

**Material Examined:** 82 ♀♀, *Geomys pinetis australis*
Bangs, U.S.A.; Florida (22); 114 ♀♀, *G. p. floridanus*,
U.S.A.; Florida (13) [includes McGregor type-
slide of T. scleritus containing 4 ♀♀, USNM Cotype
No. 53293, from which we designate a ♀ (circled
on slide) as lectotype]; 14 ♀♀, *G. p. goffi* Sherman,
U.S.A.; Florida (3), Georgia; 49 ♀♀, *G. p. mobilensis*
Merriam, U.S.A.; Florida (5), Alabama (2); 5 ♀♀,
*G. p. pinetis* Rafinesque, U.S.A., Georgia (2); 6 ♀♀,
*G. colinus* Bangs, U.S.A., Georgia (2); 25 ♀♀, *G.
cumberlandicus* Bangs, U.S.A., Georgia (3); 5 ♀♀,
*G. fontanelus* Sherman, U.S.A., Georgia.

2a. **Geomydoecus geomydis geomydis** (Os-
born) FIG. 144

Ent. 7: 54. Type-host: *Geomys bursarius* (Shaw).

♀ HW 0.40-0.44; temple as in FIG. 32; scape as in FIG. 144.
Abdomen with medium tergoentral setae; terminalia as in
FIG. 11. TBL. 1.25-1.41. Genitalia (FIG. 101, 105) with en-
domeral plate triangular and apically divided, parameral arch
as shown, and sac with 6 large spines; GW 0.15-0.17.

♂ HW 0.44-0.49, as in FIG. 37, less often 36 or 38; temple
as in FIG. 32 or 54. Last tergite variably as in FIG. 69 or 73.
Subgenital plate as in FIG. 10; tergoentral setae on VII equal
to those on VI. TBL. 1.24-1.38. Genital chamber particles as in
FIG. 66; genital chamber sac (FIG. 93) with numerous
anterior loops.

The ♀, with the scape type, marginal spiniform
temple setae, dimensions, and genitalic features,
including 6 spines in the sac, is close to those of
*G. g. subgeomydis* n. subsp. and *G. illinoensis* n. sp.;
it is apparently inseparable from the latter and
separable from the former on differences in several
dimensions. The ♀ is either inseparable or tenu-
ously separable from those of a number of other
species for which the ♀ is diagnostically charac-
teristic; *G. g. geomydis* has a different genital chamber
sac than *G. illinoensis* and differs in dimensions and
occasional slight differences in genital chamber
sac structure from *G. g. subgeomydis*.

The distribution of *G. g. geomydis* appears to
be essentially on subspecies of *Geomys bursarius*
occurring from Kansas northward (FIG. 147).

**Material Examined:** 29 ♀♂, 38 ♀♀, *Geomys
bursarius bursarius*, U.S.A., Minnesota (3), North
Dakota, South Dakota; 5 ♀♂, 12 ♀♀, *G. b. lutescens*
Merriam, U.S.A., Nebraska (4); 19 ♀♂, 10 ♀♀,
*G. b. majusculus* Svenk, U.S.A., Nebraska, Kansas;
24 ♀♂, 21 ♀♀, *G. bursarius*, U.S.A., Nebraska (6),
Kansas, Iowa (2). Questionable record: 1 ♀♂,
1 ♀, *G. b. major* Davis, U.S.A., Texas.

2b. **Geomydoecus geomydis subgeomydis**

Price & Emerson, n. subsp.

**Type-host:** *Geomys bursarius brazensis* Davis.

♀ HW 0.35-0.37. TBL. 1.11-1.15. GW 0.13-0.14 (FIG.
135). Otherwise, as for *G. g. geomydis*.

♂ HW 0.39-0.41 (FIG. 40). TBL. 0.99-1.05. Genital chamber
sac intermediate between FIG. 93 and 94, typically with 4-6
anterior loops. Otherwise, as for *G. g. geomydis*.

The separation of both sexes from *G. g. geomydis*
is based essentially on consistent differences in
dimensions. This subspecies, from the 2 collections
to date, is limited to southeastern Texas (FIG. 147).

**Material Examined:** Holotype ♀, allotype ♀,
*Geomys bursarius brazensis*, Huntsville, Walker Co.,
Texas, 12.V.1957, R. D. Hodiggins, RW 2320; in

2c. **Geomydoecus geomydis subgeomydis**

Price & Emerson, n. subsp.

**Type-host:** *Geomys bursarius brazensis* Davis.

♀ HW 0.35-0.37. TBL. 1.11-1.15. GW 0.13-0.14 (FIG.
135). Otherwise, as for *G. g. geomydis*.

♂ HW 0.39-0.41 (FIG. 40). TBL. 0.99-1.05. Genital chamber
sac intermediate between FIG. 93 and 94, typically with 4-6
anterior loops. Otherwise, as for *G. g. geomydis*.
FIG. 21–40. Geomydopus panamensis terminalia: (21) ♀; (22) ♂. G. traubi terminalia: (23) ♂; (24) ♀. G. polydentatus: (25) ♀ subgenital plate setae. G. costaricensis terminalia: (26) ♀; (27) ♂. G. copei: (28) ♀ terminalia. ♀ head outline: (29) G. jonesi; (30) G. panamensis; (31) G. dariensis; (32) G. copei; (33) G. neogori (ex P. g. gymnurus); (34) G. costaricensis; (35) G. yucatanensis; (36) G. o. oregonus; (37) G. expansus (ex P. castanopti); (38) G. scleritus (ex G. p. pinetis); (39) G. neocopei; (40) G. thomomyus (ex T. mazama glacialis).
collection of United States National Museum. Paratypes: 5 ♂, 8 ♀, same data as holotype; 2 ♂, 1 ♀, same, except RW 2321.

2c. *Geomydocus illinoensis* Price & Emerson, **n. sp.** FIG. 82
Type-host: *Geomys bursarius illinoensis* Komarek & Spencer.
♂. As for *G. g. geomydis*.
♀. As for *G. g. geomydis*, except for distinct difference in genital chamber sac (FIG. 82), with its having irregular lines forming not over 3–5 highly irregular loops, sometimes none.

The gross difference in the lines of the genital chamber sac of the ♀ is the feature distinguishing this species. Were it not for the excellent series at hand and for the consistency of this character for all specimens, we would not consider it of specific importance, especially in the absence of any apparent differences between the ♂. However, we feel this separation is justified. The type-host of *G. illinoensis* represents an isolated eastern-most subspecies of *Geomys bursarius* that has followed the Illinois River up from where it joins the Mississippi River near St. Louis (FIG. 147).


2d. *Geomydocus ewingi* Price & Emerson, **n. sp.**

Type-host: *Geomys bursarius major* Davis.
♂. HW 0.37–0.43; temple margin as in FIG. 42; scape as in FIG. 144. Abdomen with medium tergocentral setae; terminalia as in FIG. 11. TBL 1.11–1.24. Genitalia as in FIG. 135, but with only 4 large spines in sac; GW 0.13–0.14.
♀. HW 0.40–0.45 (FIG. 40, less often 38); temple as in FIG. 52. Last tergite as in FIG. 69 or 73. Subgenital plate as in FIG. 10; tergocentral setae on VII equal to or slightly longer than those on VI. TBL 1.00–1.26. Genital chamber particles as in FIG. 66; genital chamber sac intermediate between FIG. 93 and 94, with 4–7 irregular loops.

The ♂ is easily separated from other members of this group by the presence of only 4 spines on the genital sac; it is separated from *G. texanus* Ewing, which has a similar genital sac spination, by its smaller dimensions and differences in temple setae. The ♀ is apparently inseparable from those of several other species. The distribution is shown in FIG. 147.


3a. *Geomydocus californicus* (Chapman) FIG. 105
*Trichodectes californicus* Chapman, 1897, Ent. News **8**: 186. Type-host: *Perognathus* sp. (pocket mouse)—error. Probably *Thomomys bottae bota* (Eyduox & Gervais).
♂. HW 0.37–0.44; temple (FIG. 41) with submarginal seta more than 2× length of longer marginal spiniform seta; scape as in FIG. 143. Abdomen with medium to long tergocentral setae; terminalia near FIG. 11. TBL 1.20–1.36. Genitalia variably as in FIG. 101, 105, or 135; GW 0.14–0.16.
♀. HW 0.41–0.43 (FIG. 38 or 40); temple (FIG. 52) with submarginal seta always extending beyond apices of marginal setae. Last tergite usually as in FIG. 73, occasionally near 69. Subgenital plate as in FIG. 10; tergocentral setae on VII approximately equal to those on VI. TBL 1.08–1.17. Genital chamber particles as in FIG. 66; genital chamber sac (FIG. 93) with 5 or more anterior loops.

The ♂ with the posterior marginal process on the scape, both sexes with the long submarginal seta on the temple, and the ♀ with the genital chamber sac with 5–12 or more anterior loops and the last tergite with 3 subequal lateroposterior setae grouped together each side, distinguish this species. The ♀ is not readily separable from *G. geomydis*, *G. ewingi*, or *G. oregonus* n. sp., other than by host association; the ♂ is apparently indistinguishable from some ♂♂ of *G. oklahomensis* n. sp.

*Geomydocus californicus* is widely distributed throughout the southwestern U.S.A. and in isolated pockets in Mexico (FIG. 150). This species was described by Chapman (1897) from a single ♀ which obviously was taken from an incorrect host, a pocket mouse from Baja California. Werncke (1945) identified specimens from *T. bottae bottae* as this species, thereby fixing the type-host.

FIG. 41–77. ♂ temple margin: (41) Geomydoecus mexicanus; (42) G. o. oregonus; (43) G. expansus (ex P. c. castanops); (44) G. truncatus; (45) G. costariensis; (46) G. yucatanensis; (47) G. darieyi; (48) G. neoquepi; (49) G. jonesi; (50) G. copei; (51) G. thomomyus (ex T. mazama glauculus). ♀ temple margin: (52) G. o. oregonus; (53) G. mexicanus; (54) G. umbrini (ex T. u. crassidens); (55) G. costariensis; (56) G. neoquepi; (57) G. truncatus; (58) G. selenites (ex G. p. pinetis); (59) G. expansus (ex P. c. castanops); (60) G. yucatanensis; (61) G. thomomyus (ex T. mazama glauculus). ♂ genital chamber particles: (62) G. thomomyus (ex T. monticola); (63) G. trauhi; (64) G. panamensis; (65) G. nemegregori (ex P. g. gymnurus); (66) G. jonesi. ♀ last tergite: (67) G. chapini (ex O. h. chitiensis); (68) G. mexicanus; (69) G. umbrini (ex T. u. crassidens); (70) G. veracruzensis; (71) G. coronadoi; (72) G. polydentatus; (73) G. truncatus; (74) G. dakotensis; (75) G. trauhi; (76) G. neoquepi; (77) G. p. perotensis.
T. b. simulus Nelson & Goldman, Mexico, Sinaloa (4); 27♂♂, 23♀♀, T. b. simulus Merriam, Mexico, Sinaloa (8); 33♂♂, 39♀♀, T. bottae, U.S.A., Utah, Arizona, California (6), New Mexico (3), and Mexico, Sinaloa (2); 4♂♂, 1♀♀, T. umbrinus (Richardson), U.S.A., Utah, California; 11♂♂, 1♀♀, T. umbrinus n. subspp., Mexico, Sinaloa, Chihuahua; 1♂, 1♀♀, T. [baileyi] tularosea Hall, U.S.A., New Mexico; 12♂♂, 12♀♀, T. victor, U.S.A., Arizona; 47♂♂, 51♀♀, Thomomys sp. (or "gopher"), U.S.A., Arizona (5), California (5), and Mexico, Sinaloa (5), Nuevo Leon.

3b. Geomydceus umbrini Price & Emerson, n. sp. FIG. 54, 69, 93, 101, 135, 143
Type-host: Thomomys umbrinus parviceps Nelson & Goldman.

♀ Essentially as for G. californicus, but with temple margin (FIG. 41) having submarginal seta not more than 2× length of longer marginal spiniform seta.

♂ Close to G. californicus, differing only by temple margin (FIG. 54) with submarginal seta not extending beyond apices of marginal setae, and TBL 1.18–1.24.

This species is very close to G. californicus in both sexes, but the use of the length of the submarginal temple seta has proven consistently reliable in separating these species. It would appear as if this difference supports the separation of what was considered by Hall & Kelson (1959) as Thomomys umbrinus into what Russell (1968) considers as T. umbrinus and T. bottae. The distribution of G. umbrini lies in northwestern Mexico (FIG. 148).

Material Examined: Holotype ♂, allotype ♀, Thomomys umbrinus parviceps, San Lorenzo, Sinaloa, Mexico, 1.V.1965, 97136; in collection of University of Kansas. Paratypes: 5♂♂, 8♀♀, same data as holotype; 6♂♂, 15♀♀, Aguacaliente, Sinaloa, Mexico, 1.V.1965, 97132, 97133; 10♂♂, 4♀♀, San Lorenzo, Sinaloa, Mexico, 1.V.1965, 97139. Other specimens: 29♂♂, 25♀♀, T. u. atrovirbus J. A. Allen, Mexico, Sinaloa (4); 2♂♂, 2♀♀, T. u. crassidentis Nelson & Goldman, Mexico, Zacatecas; 8♂♂, 11♀♀, T. u. durangi Nelson & Goldman, Mexico, Durango (3); 9♂♂, 8♀♀, T. u. eximius Nelson & Goldman, Mexico, Sinaloa; 2♂♂, 2♀♀, T. u. zacatecae Nelson & Goldman, Mexico, Zacatecas; 4♂♂, 9♀♀, T. umbrinus n. subspp., Mexico, Sinaloa; 2♀♀, Thomomys sp., Mexico, Sinaloa.

3c. Geomydceus quadridentatus Price & Emerson, n. sp. FIG. 94, 106, 146
Type-host: Thomomys bottae Merriam.

♂ HW 0.37–0.39; temple margin (FIG. 41) with submarginal seta about 2× length of longer marginal spiniform seta; scape as in FIG. 143. Abdomen and TBL as for G. californicus. Genitalia (FIG. 106) with only 4 large spines on sac; GW 0.14–0.15.

♀ HW 0.42–0.43 (FIG. 38 or 40); temple margin (FIG. 34) with submarginal seta not extending beyond apex of longer adjacent marginal seta. Last tergite as in FIG. 73. Subgenital plate as in FIG. 10; tergoventral setae on VII about equal to those on VI. TBL 1.15–1.23. Genital chamber particles as in FIG. 66; genital chamber sac (FIG. 94) with only 1–4 anterior loops.

The ♂, with the scape as for G. californicus and G. umbrinus, is separated from those species on the basis of the genital sac having only 4 large spines instead of 6. The ♀, also close to those 2 species, may be distinguished by its smaller number of anterior loops in the genital chamber sac. The distribution of G. quadridentatus is apparently restricted to that of the 2 subspecies of Geomydceus arenarius (FIG. 148).


3d. Geomydceus subcalifornicus Price & Emerson, n. sp.

Type-host: Thomomys bottae (Eyndon & Gervais).

♂ HW 0.39–0.40; temple margin (FIG. 41) with submarginal seta more than 2× length of longer marginal spiniform seta; scape as in FIG. 143. Abdomen with medium to long tergoventral setae; terminalia near to FIG. 11. TBL 1.32–1.36. Genitalia (FIG. 106) with only 4 large spines on sac; GW 0.15–0.16.

♀ HW 0.44–0.45 (FIG. 37 or 40); temple margin (FIG. 52) with submarginal seta extending well beyond apices of marginal setae. Last tergite as in FIG. 69 or 73. Subgenital plate as in FIG. 10; tergoventral setae on VII about equal to those on VI. TBL 1.27–1.32. Genital chamber particles as in FIG. 66; genital chamber sac (FIG. 93) with 5 or more anterior loops.

The ♂, with the process on the scape and only 4 spines on the genital sac, is close to that of G. quadridentatus, but may be separated by differences in length of the submarginal temple seta and often by head size. The ♀, while apparently morphologically inseparable from those of G. geomydis geomydis, G. oregonus idahoensis n. subspp., and G. ewingi, is separated from G. quadridentatus by having more loops in the genital chamber sac. This species has an odd discontinuous distribution from southern California to 2 widely-spaced locations in Mexico (FIG. 147).

Material Examined: Holotype ♂, allotype ♀, Thomomys bottae, Colorado Desert, California, 17.II.
FIG. 78–99. ♂ head outline: (78) Geomyodes swernecki; (79) G. expansus (ex P. ziuzer). ♀ genital chamber sac: (80) G. trauhi; (81) G. scelerus (ex G. p. pinetis); (82) G. illinoensis; (83) G. thomomys (ex T. monticola); (84) G. truncatus; (85) G. wuerti; (86) G. trichopus; (87) G. mexicanus; (88) G. alcorni; (89) G. megatorix; (90) G. jonesi; (91) G. opfer; (92) G. castanensis; (93) G. umbret; (94) G. quadridentatus; (95) G. polydentatus; (96) G. chapini (ex O. h. chiapensis); (97) G. tolucae; (98) G. bulleri (ex P. b. burtii); (99) G. panamensis.
arch as in Fig. 103, and only 4 large spines on the genital sac, is close to that of *G. ewingi*; these 2 species may be separated by the dimensions of the head and genitalia and by the length of the submarginal temple seta. Dimensions, details of the genital chamber sac, and chaetotaxy of the temple and terminalia enable separation of *G. texanus* from *♀* of other species. The distribution of *G. texanus* (Fig. 148) would appear to support Hall & Kelson (1959) in the placement of *Geomys tropicalis* Goldman as a subspecies of *G. personatus* than maintaining it to be a separate species.


5. **Geomys truncatus** Wernecke

**Fig.** 44, 57, 73, 84, 121


♀. HW 0.41–0.42; temple margin (Fig. 44) with short submarginal seta; scape as in Fig. 145. Abdomen with medium tergocentral setae; terminalia as in Fig. 11. TBL 1.10–1.12. Genitalia (Fig. 103) with triangular endosomal plate showing suggestion of apical division, parameral arch as shown, and sac with only 4 large spines; GW 0.17–0.18; endosomal plate for specimens from *Pappogeomys castanops* (Baer) more as in Fig. 104, with apical division, but otherwise similar.

♀. HW 0.45–0.51 (Fig. 36 or 37); temple margin (Fig. 38) with submarginal seta on 1 side occasionally variably more medially to inner marginal seta than shown. Last tergite intermediate between Fig. 67 and 73. Subgenital plate as in Fig. 10; tergocentral setae on VII longer than those on VI. TBL 1.13–1.32. Genital chamber particles as in Fig. 65; genital chamber sac (Fig. 94) with only few anterior loops.

The ♀, by having a scape without a distinct process, spiniform setae on the temple margin, genitalia with endosomal plate and parameral...

♀. HW 0.37–0.41; temple margin (Fig. 51) with very long seta; scape as in Fig. 145. Abdomen with medium to long tergocentral setae (Fig. 14); terminalia near Fig. 14. TBL. 1.22–1.37. Genitalia (Fig. 114) with endomeral plate varying in size from Fig. 115 to 116; GW 0.15–0.16.

♂. HW 0.37–0.42 (Fig. 40); temple margin (Fig. 61) with very long seta. Last tergite as in Fig. 74. Subgenital plate as in Fig. 12; tergocentral setae (Fig. 12) with those on VII long medially, short laterally. TBL. 1.05–1.15. Genital chamber particles as in Fig. 62; genital chamber sac (Fig. 83) small, with fines only laterally.

Both sexes with the very long temple seta, the ♀ with the genitalia having the unique 2 elongate sclerites and 1–2 shorter sclerites on the sac as well as having the parameral arch and endomeral plate as in Fig. 114, and the ♀ with the small genital chamber sac lined only laterally, enable easy separation from species of other groups. *Geomydeus thomomys* is widely distributed on 3 species of *Thomomys* occurring in the western and northwestern areas of the U.S. and southern Canada (Fig. 148).


6b. *Geomydeus dakotensis* Price & Emerson, n. sp. Fig. 74, 117, 118

Type-host: *Thomomys talpoides rufescens* Wied.

Neuwied.

♀. Close to *G. thomomys*, but with sclerites of genital sac as in Fig. 117 or 118, having 4–5 short sclerites in addition to 2 elongate ones; GW 0.13–0.16.

♂. As for *G. thomomys*.

The consistent possession by *G. dakotensis* of 4–5 short sclerites on the ♀ genital sac, while *G. thomomys* has only 1–2 of these, necessitates the recognition of these as distinct taxa, even though there is no apparent way to distinguish the ♀♀. The specimens from Montana are not in optimum condition, but we have tentatively placed them as conspecific with *G. dakotensis*; the wide discontinuity between these 2 *Thomomys* subspecies with *G. dakotensis* is somewhat unexpected (Fig. 148), with the intervening subspecies having the more typical *G. thomomys*.


6c. *Geomydeus duchesnensis* Price & Emerson, n. sp. Fig. 112, 113

Type-host: *Thomomys talpoides* (Richardson)—probably *T. t. unta* Merriam.

♀. Much as for *G. thomomys*, but with genitalia (Fig. 112) smaller, GW 0.11–0.12, endomeral plate as in Fig. 113, and genital sac lacking elongate sclerites and with at most 1 short sclerite. TBL. 1.08–1.19.

♂. Close to *G. thomomys*, but apparently without evident genital sac and accompanying lines.

The ♀ is easily separated from that of both *G. thomomys* and *G. dakotensis* by the essential absence of sclerites associated with the genital sac; the ♀ is tentatively recognizable by the absence of a genital chamber sac. *Geomydeus duchesnensis* most likely represents a population along one of the tributaries of the Strawberry River (Fig. 148) that has had the ♀ ♀ undergo sufficient change to make them differ significantly from those of the surrounding populations.


7a. *Geomydeus oreonius oreonius* Price & Emerson, n. sp. Fig. 10, 11, 13, 16, 23, 52, 133

Type-host: *Thomomys bulbulivorus* (Richardson).

♀. HW 0.44–0.45; temple margin (Fig. 42) with long submarginal and 2 spiniform marginal setae; scape as in Fig. 145. Abdomen with medium to long tergocentral setae; terminalia
FIG. 100–106. ♂ genitalia: (100) Geomydoeus jonesi; (101) G. umbrini (ex T. u. atrovarius); (102) G. allenii; (103) G. texanus (ex G. tropicalis); (104) G. texanus (terminal portion only, ex P. c. rubellus); (105) G. californicus (ex T. b. anitae); (106) G. quadridensatus.
as in FIG. 11. TBL. 1.36–1.40. Genitalia usually close to FIG. 133, less often near to FIG. 101 or 105, with subtriangular endomeral plate divided apically, parameral arch as shown, and sac with 6 large spines; GW 0.16–0.17.

♀. HW 0.47–0.50 (FIG. 36); temple margin (FIG. 52) with submarginal seta usually extending beyond apex of longer marginal seta. Last tergite as in FIG. 13. Subgenital plate as in FIG. 10; tergoventral setae on VIII approximately equal to those on VI. TBL. 1.22–1.31. Genital chamber particles as in FIG. 66; genital chamber sac (FIG. 93) with 5 or more loops in anterior portion.

The ♂ is recognized by its combination of scape without posterior projection, the temple with a long submarginal and 2 spinoform marginal setae, genitalia with parameral arch, endomeral plate, and sac essentially as in FIG. 133, and size. The ♀ is separated on the basis of the combination of setae of last tergite evenly spaced lateroposteriorly and relatively long, the genital sac with number of anterior loops, the dimensions, the placement and length of the submarginal temple seta, and length of tergal setae of VII; it is apparently inseparable from some individuals of G. geomydis geomydis, but geographical and host separation should enable proper placement (FIG. 147, 149).


7c. Geomydocus tolucae Price & Emerson, n. sp. FIG. 97, 122

Type-host: Thomomys unbrimus tolucae Nelson & Goldman.

♂. HW 0.39–0.40; temple margin, scape, and abdominal chaetotaxy as for G. o. oregonus. TBL. 1.28–1.39. Genitalia (FIG. 122) much as for G. o. oregonus, but with definite expansion of posterior portion of parameral arch and with endomeral plate as shown; GW 0.16–0.17.

♀. HW 0.44 (FIG. 37). Genital chamber sac (FIG. 97) with all lines posteriorly directed. Otherwise, much as for G. o. oregonus.

The expansion of the parameral arch of the ♂ genitalia sets G. tolucae apart from all other known species of the genus. The ♀ genital chamber sac has a configuration of lines quite different from that of G. oregonus.

Material Examined: Holotype ♂, allotype ♀, Thomomys unbrimus tolucae, Nevada de Toluca, Raíces, Mexico, 14.III.1963, B-64564; in collection of United States National Museum. Paratypes: 1 ♂, same data as holotype; 1 ♂, Toluca, Mexico, 5.III.1963, B-64286. Other material: 6 ♂♂, T. unbrimus, Mexico, Nevada de Toluca (2); 1 ♂, 1 ♀, Thomomys sp., Mexico, Nevada de Toluca (we have been unable to verify the identity of these hosts since the skins are not available).

8a. Geomydocus copei Werneck FIG. 7, 22, 32, 50, 91, 139

FIG. 107–119. ♀ genitalia: (107) Geomydowea chiapensis; (108) G. expansus (ex P. e. castanops); (109) G. werneki (terminal portion only); (110) G. megaporini (ex P. g. gymurus); (111) G. alcorni (terminal portion only); (112) G. duchesnensis; (113) G. duchesnensis (endomeral plate only); (114) G. homomonyus (ex T. mazama glacialis); (115) G. homomonyus (endomeral plate only, ex T. talpoides, Utah); (116) G. homomonyus (endomeral plate only, ex T. talpoides, Canada); (117, 119) G. dakotensis (genital sac sclerites only); (119) G. panamensis.
FIG. 120–132. ♂ genitalia: (120) Geomydoecus trichopi; (121) G. truncatus; (122) G. tolucae; (123) G. bulleri (ex P. b. melanurus); (124) G. wardsi; (125) G. yucatanensis (endomeral plate only); (126) G. yucatanensis (parameral arch only); (127) G. yucatanensis; (128, 129) G. chapini (terminal plates only, ex O. k. chiapensis); (130) G. copei; (131) G. neocopei; (132) G. minor (ex Thomomys sp., Arizona).
Cruz 42: 114. Type-host: “Geomys mexicanus” from Misantla = Orthogeomys hispidus torridus (Merriam).

♂. HW 0.55–0.56; temple margin (FIG. 50) with short submarginal seta and short fine marginal setae; scape as in FIG. 145. Abdomen with setae much as in FIG. 5, but with anterior tergal setae as in FIG. 7; terminalia essentially as in FIG. 5. TBL. 1.41–1.33. Genitalia (FIG. 130) with both endomerol plate and parameral arch attenuated and narrow, sac small and without spines; GW 0.06–0.07.

♀. HW 0.60–0.62 (FIG. 32), large in proportion to body size and with scape unusually small for such large head; temple margin as in FIG. 50. Last tergite as in FIG. 67. Subgenital plate as in FIG. 28; tergozentral seta on VII longer than those on VI. TBL. 1.34–1.39. Genital chamber particles as in FIG. 65; genital chamber sac (FIG. 91) with all lines posteriorly converging.

The ♂ genitalia and abdominal chaetotaxy are so uniquely different from those of species in other groups that there should be no problem recognizing G. copei. The ♀ is separated on the basis of the grouping and length of the lateroposterior setae on the last tergite, the large dimensions, and the chaetotaxy of the terminalia and temple.

Since O. hispidus torridus is the only species of pocket gopher found in Misantla, Mexico, we have concluded that this is most likely the correct type-host for G. copei (FIG. 149).

Material Examined: 4 ♂♂, 4 ♀♀ paratypes of G. copei, “Geomys mexicanus,” Mexico, Misantla (2).

8c. Geomydocoeus wardi Price & Emerson, n. sp. FIG. 5, 8, 39, 48, 56, 76, 131

Type-host: Thomomys unbrinus tolucae Nelson & Goldman.

♂. HW 0.36–0.38; temple margin (FIG. 48) with short submarginal seta and short to medium fine marginal setae; scape as in FIG. 145. Abdomen and terminalia as in FIG. 5. TBL. 1.18–1.20. Genitalia (FIG. 131) with irregularly broadened endomeral plate, sharply attenuate parameral arch, and small sac without large spines: GW 0.08–0.09.

♀. HW 0.40–0.41 (FIG. 39); temple margin (FIG. 56) much as for ♂. Last tergite as in FIG. 76. Subgenital plate as in FIG. 8; tergozentral setae (FIG. 8) long, those on VII equal to those on VI. Genital chamber particles and sac weak to inconspicuous.

The ♂ of G. neocoepi may be separated from the other species by the details of the genitalia, such as small sac without large spines, expanded endomeral plate, and small size, along with the absence of spiniform setae on the temple margin and the clustering of setae on tergites II–III. The ♀ is recognized by the length and distribution of the setae on the last tergite, the inconspicuous genital chamber sac, and the marginal temple setae; there is no apparent way to separate ♀♀ of G. neocoepi and G. minor Werneck. Geomydocoeus neocoepi has been collected from the same individuals that have also yielded specimens of G. tolucae (FIG. 150).

Material Examined: Holotype ♂, allotype ♀, Thomomys unbrinus tolucae, Nevada de Toluca, Toluca, Mexico, 5.III.1963, B-64285; in collection of United States National Museum. Paratypes: 6 ♂♂, 8 ♀♀, same data as holotype; 1 ♂, 1 ♀, same, except B-64286; 1 ♂, 6 ♀♀, Nevada de Toluca, Raices, Mexico, 14.III.1963, B-64564. Other material: 3 ♂♂, 7 ♀♀, T. unbrinus, Mexico, Nevada de Toluca; 1 ♀, Thomomys sp., Mexico, Nevada de Toluca (we have been unable to verify the identity of these hosts since the skins are not available).

8d. Geomydocoeus wardi Price & Emerson, n. sp. FIG. 9, 85, 124

Type-host: Thomomys talpoides macrotis F. W. Miller.

♂. Much as for G. neocoepi, except for TBL 1.05–1.18; terminalia as in FIG. 9; and genitalia (FIG. 124) larger, GW 0.10–0.11, with larger sac but without spines, and with apically narrower endomeral plate.

♀. HW 0.36–0.40 (FIG. 39). Genital chamber sac as in FIG. 85. Otherwise, as for G. neocoepi.

The ♂ of G. wardi is very close to that of G. neocoepi, but may be separated by differences in the genitalia associated with gross size, the development of the sac, and the shape of the endomeral plate and parameral arch. The ♀ of G. wardi is likewise close to that of G. neocoepi, being tenuously separable only on the basis of the development of the genital chamber sac. The known distribution of G. wardi is on various subspecies of T. talpoides occurring in the west-central U.S. (FIG. 149); a number of individuals with G. wardi also had G. thomomys, but this cohabitation is apparently limited to T. talpoides in the eastern portion of the range of this host species.

Mexico (2).

8d. Geomydoecus minor Werneck  fig. 4, 132


♀. HW 0.35-0.37; temple, scape, and terminalia essentially as for G. neocopei. Abdominal setae much as in Fig. 5, but with setae on tergites II-III widely separated and short (Fig. 4). TBL 1.12-1.16. Genitalia (Fig. 132) with both endomeral plate and parameral arch sharply tapered and with small sac without large spines; GW 0.06.

♂. As for G. neocopei.

The recognition of G. minor as a species distinct from G. neocopei and G. wardi is based primarily on the chaetotaxy of ♀ tergites II-III and on features of the ♀ genitalia. Agreement with the description by Werneck (1950) is excellent. The geographical distribution of known material is given in Fig. 149.


9a. Geomydoecus chapini Werneck  fig. 17, 67, 96, 128, 129


♀. HW 0.53-0.55; temple margin (Fig. 46) with 2 short spiniform setae and short submarginal seta medially anterior to these; scape as in Fig. 145. Abdomen with short tergal and basal setae (Fig. 17); terminalia as in Fig. 17. TBL 1.28-1.41. Genitalia grossly as in Fig. 127, but with endomeral plate and parameral arch as in Fig. 128 and 129; GW 0.08-0.09.

♂. HW 0.60-0.63 (Fig. 34); temple margin (Fig. 60) with short submarginal seta medially to 2 short marginal setae. Last tergite as in Fig. 67. Subgenital plate as in Fig. 26; tergal setae on VII longer than those on VI. TBL 1.35-1.51. Genital chamber particles as in Fig. 66; genital chamber sac (Fig. 96) with most lines converging posteriorly.

The ♀ is recognizable on the basis of its antennal type, the development of the temple setae, the large dimensions, and the details of the genitalia involving no spines on the genital sac and an endomeral plate and parameral arch shaped as illustrated. The ♀ is separated from other species on the basis of its abdominal chaetotaxy, especially of the last tergite, the genital chamber sac structure, the temple setae, and the large dimensions. All material we have seen from Geomyx tropicalis has been of Geomydoecus texanus, and we seriously doubt if that is the correct type-host for G. chapini.

Material Examined: 1 ♀, Geomyx personatus tropicalis, Mexico, Tabasco (holotype of G. chapini, USNM 57834); 3 ♀♀, 9 ♀♂, Orthogomys hispidus chiapensis, Mexico, Chiapas (2).

9b. Geomydoecus yucatanensis Price & Emerson, n. sp.  fig. 35, 46, 60, 125-127

Type-host: Orthogomys hispidus yucatanensis (Nelson & Goldman).

♀. HW 0.51. Genitalia (Fig. 127) with endomeral plate relatively broad (Fig. 125) and sharply attenuate parameral arch (Fig. 126). Otherwise, as for G. chapini.

♂. HW 0.56-0.59 (Fig. 34). TBL 1.35-1.49. Otherwise, as for G. chapini.

Although both sexes of G. yucatanensis are very much like G. chapini, the shape of the endomeral plate of the ♀ genitalia, along with the apparently smaller dimensions of both ♀ and ♂ G. yucatanensis, offers a means for separating these 2 species.

Material Examined: Holotype ♀, allotype ♀, Orthogomys hispidus yucatanensis, Escarcega, Campeche, Mexico, 26.XII.1962, PLC-3436; in collection of University of Kansas. Paratypes: 1 ♂, 4 ♀♀, same data as holotype; 2 ♀♂, 1 ♀, Tizimín, Yucatan, Mexico, 29.IV.1963, PLC-4235; 4 ♀♂, 8 ♀♀, Campoton, Campeche, Yucatan, Mexico, 11.VII.1962, JKJ-3712.

10a. Geomydoecus jonesi Price & Emerson, n. sp. fig. 13, 20, 29, 49, 66, 90, 100

Type-host: Orthogomys grandis felipensis Nelson & Goldman.

♀. HW 0.63-0.68; temple margin (Fig. 49) without spiniform setae; scape as in Fig. 145. Abdomen with short tergal setae; terminalia as in Fig. 20. TBL 1.75-1.86. Genitalia (Fig. 100) with endomeral plate and parameral arch as shown, and with sac having 4 large spines; GW 0.25-0.26.

♂. HW 0.67-0.70 (Fig. 29); temple as in Fig. 49. Last tergite much as in Fig. 73, but with setae somewhat longer than shown. Subgenital plate as in Fig. 13; tergal setae on VII longer than those on VI. TBL 1.72-1.75. Genital chamber particles as in Fig. 66; genital chamber sac (Fig. 90) with posteriorly converging lines.

The ♀ is recognized by lacking the process on the scape, lacking spiniform or long setae on the temple, and having very large dimensions as well as distinctive genitalia. The ♀ is separated from other species by the chaetotaxy of the last tergite, the very large dimensions, the large distinctive genital chamber development, and details of the temple setae.


10b. Geomydoecus allenii Price & Emerson, n. sp. fig. 102

Type-host: Orthogomys grandis allenii Nelson &
FIG. 133-146. ♀ genitalia: (133) Geomydisius o. oregonus; (134) G. castaicensis; (135) G. umbrini (ex T. u. crassidens); (136) G. merriami; (137) G. polydentatus; (138) G. taylori; (139) G. fulvipes; (140) G. p. perotensis; (141) G. mexicanus (endosomal plate only); (142) G. mexicanus. ♂ scape; (143) G. umbrini (ex T. u. crassidens); (144) G. g. geomydis; (145) G. expansus (ex P. e. castanops). ♀ antenna: (146) G. quadridentatus.
Goldman.

♀. TBL 1.65. Genitalia (FIG. 102) with endomeral plate broad and with notch as shown; GW 0.21. Otherwise, as for G. jonesi.

♂. HW 0.65–0.68; temple margin (FIG. 60) with submarginal seta removed from inner marginal seta by more than distance between 2 marginal setae. Otherwise, as for G. jonesi.

The ♀, although very close to that of G. jonesi, is separated by the smaller genitalia and by a difference associated with the shape of the endomeral plate of the genitalia. The ♀ is apparently inseparable from G. chiapensis n. sp., and is close to G. jonesi, being differentiated from the latter by the positioning of the submarginal seta in relation to the marginal temple setae.

Material Examined: Holotype ♀, allotype ♂, Orthogeomys grandis alleni, Soledad, Oaxaca, Mexico, 25.VIII.1954, KU-62524; in collection of University of Kansas. Paratypes: 2 ♀♂, 4 ♀♀, same data as holotype.

11. Geomydoecus chiapensis Price & Emerson, n. sp. FIG. 107

Type-host: Orthogeomys hispidus chiapensis (Nelson & Goldman).

♀. HW 0.66; temple margin as in FIG. 45; scape as in FIG. 145. Abdomen with short tergo-central setae; terminalia as in FIG. 27. TBL 1.82. Genitalia (FIG. 107) with endomeral plate strongly attenuate and deeply divided apically, parameral arch as shown, and sac with 6 large spines; GW 0.24.

♂. HW 0.67–0.68 (FIG. 29); temple margin (FIG. 60) with submarginal seta distinctly mediad to inner marginal seta. Last tergite near to FIG. 67. Subgenital plate as in FIG. 13; tergo-central setae on VI longer than those on VII. TBL 1.75–1.80. Genital chamber particles as in FIG. 66; genital chamber sac (FIG. 90) large, with posteriorly converging lines.

The very large size of the ♀, along with the highly distinctive genitalic endomeral plate, separates it from all other known ♀♂. The ♀, also quite large and with a large distinctive genital chamber sac, may identify along with G. allenii and G. jonesi; differences in temple setae will separate out G. jonesi, but it is possible that some specimens of G. allenii and G. chiapensis are not separable as ♀♀. Geomydoecus chapini and G. chiapensis are both found on the same host subspecies (FIG. 147), the former from Mexico and the latter from Guatemala; further collecting may reveal both to occur on the same individuals.

Material Examined: Holotype ♀, allotype ♂, Orthogeomys hispidus chiapensis, Escuintla, Dept. Escuintla, Guatemala, 1.II.1952, L. de la Torre, CNHM 73335; in collection of Field Museum of Natural History. Paratypes: 1 immature ♀, 1 ♀♀, same data as holotype.

12a. Geomydoecus panamensis Price & Emerson, n. sp. FIG. 21, 22, 30, 64, 99, 119

Type-host: Macrogomys cavator Bangs.

♂. HW 0.59–0.60, with deep medioanterior indentation (FIG. 30); temple margin as in FIG. 45 or 47; scape as in FIG. 145. Abdomen with short to medium tergo-central setae; terminalia as in FIG. 22. TBL 1.65–1.74. Genitalia as in FIG. 119; GW 0.22–0.23.

♀. HW 0.62–0.64, with deep medioanterior indentation (FIG. 30); temple margin as in FIG. 55, but with submarginal seta occasionally more mediad. Last tergite as in FIG. 73. Subgenital plate as in FIG. 21; tergo-central setae on VII longer than those on VI. TBL 1.68–1.73. Genital chamber particles as in FIG. 64; genital chamber sac as in FIG. 99.

This species is characterized by its large size in both sexes; the ♀ genitalia with the subtriangular endomeral plate having a pointed undivided apical end, the parameral arch with a medioposterior process, and sac with 6 large spines; both sexes with a deep medioanterior head indentation; the ♀ with a large genital chamber sac with diagonal lines and median indentation or notch in the anterior margin; and the ♀ with 3 lateroposterior setae grouped together each side, more or less of equal length extending to end of abdomen.


12b. Geomydoecus dariesis Price & Emerson, n. sp. FIG. 31, 47

Type-host: Macrogomys dariesis Goldman.

♀. HW 0.61–0.62, with shallow medioanterior indentation (FIG. 31). Otherwise, much as for G. panamensis.

♂. As for G. panamensis, except for head with shallow medioanterior indentation (FIG. 31).

Both sexes are close to G. panamensis, but G. dariesis is consistently separable by having a very shallow medioanterior head indentation. These 2 species are the only ones known from Panama (FIG. 148).


13. Geomydoecus costaricense Price & Emerson, n. sp. FIG. 26, 27, 34, 45, 55, 92, 134

Type-host: Macrogomys heterodus cartagoensis (Goodwin).

♀. HW 0.52–0.53; temple margin (FIG. 45) with short sub-
marginal seta on line with or somewhat mediad to inner of 2 marginal spiniform setae; scape as in FIG. 145. Abdomen with short to medium tergocentral setae; terminalia as in FIG. 27. TBL 1.29–1.40. Genitalia (FIG. 134) with widely bifurcate endomeral plate, parameral arch as shown, and sac with 4 large spines; GW 0.14.

♀. HW 0.57–0.60 (FIG. 34); temple margin (FIG. 55) with short fine marginal setae, but otherwise as for ♂. Last tergite as in FIG. 69, less often FIG. 73. Subgenital plate as in FIG. 26; tergocentral setae on VII longer than those on VI. TBL 1.38–1.45. Genital chamber particles as in FIG. 64, but faint; genital chamber sac (FIG. 92) with sparse posteriorly directed lines and often concavity in anterior margin.

The broadly bifurcate endomeral plate of the genitalia and the genital sac with only 4 large spines enable the ♂ of *G. costaricensis* to be readily recognized. The ♀ is separable primarily on the basis of its chaetotaxy of the last tergites, the structure of the genital chamber sac, and the head width. This species is the only one known from Costa Rica (FIG. 148).

**Material Examined:** Holotype ♂, allotype ♀, *Macrolestes heterodus cartagoensis*, San Jose, Costa
Rica, 2.VI.1954, KU-60663; in collection of University of Kansas. Paratypes: 12♂, 9♀, same data as holotype; 9♂, 4♀, same, but 3.VI.1954, KU-60664.

14. Geomydoecus trichopi Price & Emerson, n. sp. FIG. 86, 120

Type-host: Zygogeomys trichopus trichopus Merriam.
♂. HW 0.44–0.46; temple margin (FIG. 42) with long submarginal and 2 spiniform marginal setae; scape as in FIG. 145. Abdomen with median tegumen; terminalia as in FIG. 18. Abdominal plate pointed and undivided apically, parameral arch as shown, and sac with 6 large spines and smaller adjacent spines; GW 0.16–0.17.
♀. HW 0.45–0.47 (FIG. 37); temple margin (FIG. 53) with long submarginal and 2 short marginal setae. Last tergite as in FIG. 77. Subgenital plate as in FIG. 10; tegumen on VII longer than those on VI. TBL 1.23–1.28. Genital chamber particles as in FIG. 65; genital chamber sac (FIG. 86) with lines only anteriorly.

The nature of the antenna, temple margin, dimensions, and genitalic features, especially with the undivided endosomal plate, makes the ♀ identify with that of G. bulleri n. sp.; however, these species are readily separated by the gross difference in the shape of the endosomal plate. The ♀ of G. trichopi is likewise close to that of G. bulleri, but they are separated by differences in the genital chamber sac lines and in the length of the medioanterior setae on the last tergite.

Material Examined: Holotype ♀, allotype ♂, Zygogeomys trichopus trichopus, Sierra Patama, Michoacan, Mexico, 29.VI.1954, KU-62520; in collection of University of Kansas. Paratypes: 15♂♂, 6♀♀, same data as holotype; 2♂♂, same, but 30.VI.1954, KU-62519; 2♂♂, 2♀♀, same, but No. 3840, Lot 56-8149, R. W. Dickerman.

15. Geomydoecus bulleri Price & Emerson, n. sp. FIG. 98, 123

Type-host: Pappogeomys bulleri bulleri (Thomas).
♂. HW 0.41–0.48; temple margin (FIG. 43) with long submarginal and 2 spiniform marginal setae; scape as in FIG. 145. Abdomen with short to medium tegumen; terminalia as in FIG. 18. TBL 1.19–1.39. Genitalia (FIG. 123) with endosomal plate having elongate narrow undivided apical process parameral arch as shown, and sac with 6 large spines; GW 0.15–0.17.
♀. HW 0.46–0.52 (FIG. 36); temple margin (FIG. 53) with long submarginal and 2 short marginal setae. Last tergite as in FIG. 76. Subgenital plate as in FIG. 10; tegumen on VII equal to or somewhat longer than those on VI. TBL 1.26–1.38. Genital chamber sac as in FIG. 65; genital chamber sac (FIG. 98) with numerous transverse lines across middle portion.

The shape and undivided nature of the ♀ endosomal plate is different from that possessed by any other known species. The ♀ is recognized by the chaetotaxy of the terminalia, including the displacement toward the midline of a pair of setae on the last tergite, by the temple setae, and by the lines of the genital chamber sac.

Material Examined: Holotype ♀, allotype ♂, Pappogeomys bulleri bulleri, Mascota, Jalisco, Mexico, 28.III.1967, PLC-12349; in collection of University of Kansas. Paratypes: 1♂, 1♀, same data as holotype; 1♂, 1♀, Jazmin, Jalisco, Mexico, 19.X. 1966, PLC-11697; 1♂, 1♀, Autlan, Jalisco, Mexico, 2.V.1967, PLC-12653; 1♂, 1♀, La Cuesta, Jalisco, Mexico, 4.IV.1967, PLC-12475. Other material: 2♂♂, 2♀♀, P. b. melanurus Genoways & Jones, Mexico, Jalisco; 1♂, 1♀, P. b. burti Goldman, Mexico, Jalisco.

16a. Geomydoecus megacleri Price & Emerson, n. sp. FIG. 18, 19, 33, 65, 89, 110

Type-host: Pappogeomys fuscus (Merriam).
♂. HW 0.48–0.52 (FIG. 78); temple margin as in FIG. 41–43; scape as in FIG. 145. Abdomen with short to medium tegumen; terminalia as in FIG. 18. TBL 1.52–1.61. Genitalia (FIG. 110) with elongate endosomal plate having distinct apical division and shoulders, parameral arch with evenly concave anterior margin, and sac with only 5 large spines; GW 0.18–0.20.
♀. HW 0.51–0.56 (FIG. 33 or 35); temple margin as in FIG. 53. Last tergite as in FIG. 76. Subgenital plate (FIG. 19) usually with 1–4 long medioanterior setae; tegumen on VII longer than those on VI. TBL 1.45–1.65. Genital chamber particles as in FIG. 65; genital chamber sac (FIG. 89) large, with papillose anterior portion and medial lines directed more or less posteriorly.

The gross details of the ♀ genitalicia and the structure of the ♀ genital chamber sac enable both sexes of this species to be separated from those of all other groups.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys fuscus, Colima, Mexico, 25.X1.1950, J. R. Alcorn, KU-39819; in collection of University of Kansas. Paratypes: 14♂♂, 33♀♀, same data as holotype; 2♂♂, 1♀, same, except KU-39818; 1♀, Colima, Mexico, 14.III.1892, E. W. Nelson, KU-33209; 1♂, 1♀, Colima, Colima, Mexico, 25.XI.1950, JRA-13524. Other material: 24♂♂, 17♀♀, P. bulleri nelsoni (Merriam), Mexico, Jalisco (2); 15♂♂, 10♀♀, P. gymnurus gymnurus (Merriam), Mexico, Jalisco (4); 1♂, 1♀, P. g. russelli Genoways & Jones, Mexico, Jalisco; 3♂♂, 7♀♀, Pappogeomys sp., Mexico, Michoacan. Questionable record: 2♂♂, 2♀♀, P. tylorhinus atratus Russell, Mexico, Jalisco.

16b. Geomydoecus wernerii Price & Emerson, n. sp. FIG. 78, 109

Type-host: Pappogeomys zinsleri (Goldman).
♂. As for G. megacleri, except genital sac always with 6 prominent spines and endosomal plate either apically un-
divided or with division difficult to discern (FIG. 109).

As for G. megacrgori.

The consistent presence of only 5 prominent spines on the g genital sac of G. megacrgori and 6 on that of G. wernecki, along with a possible difference in the apical division of the endomterial plate of the g genitalia, justifies the recognition of these as 2 distinct taxa, even in the absence of characters for separating the ♀.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys zinseri, Lagos de Moreno, Jalisco, Mexico, 15.X.1963, KU-103348; in collection of University of Kansas. Paratypes: 4 ♂♂, 2 ♀♀, same data as holotype; 5 ♂♂, 9 ♀♀, same, except KU-103347. Questionable records: 3 ♂♂, 1 ♀, P. tylerhines brevicristis Russell, Mexico, Guanajuato; 1 ♂, 1 ♀, P. t. angustirostris (Merriam), Mexico, Jalisco; 1 ♀, P. alcorni Russell, Mexico, Jalisco.

16c. Geomydocrates alcorni Price & Emerson, n. sp. FIG. 88, 111

Type-host: Pappogeomys alcorni Russell.

♂: HW 0.43-0.45. TBL 1.28-1.40. Genitalia much as in FIG. 110, except endomterial plate usually lacking apical shoulders and parameral arch with deep indentation in anterior margin (FIG. 111); apparently with 6 large spines in sac, but difficult to discern due to patch of smaller pigmented spines around 4 grouped spines; GW 0.16. Otherwise, as for G. megacrgori.

♀: HW 0.46-0.49 (FIG. 36 or 37), TBL 1.24-1.30. Genital chamber sac (FIG. 88) with number of lines transversely across median area. Otherwise, as for G. megacrgori.

The ♂, on the basis of its smaller dimensions and differences in the posterior plates of the genitalia, is separable from both G. megacrgori and G. wernecki. The ♀ of G. alcorni is separated from these 2 species by its smaller size and different configuration of the lines of the genital chamber sac.

The 3 species of this group—G. megacrgori, G. wernecki, and G. alcorni—are known from at least 5 species of Pappogeomys fairly compactly distributed across central Mexico (FIG. 149).

Material Examined: Holotype ♂, allotype ♀, Pappogeomys alcorni, Mazamitla, Jalisco, Mexico, 18.X.1950, KU-39806; in collection of University of Kansas. Paratypes: 3 ♂♂, 4 ♀♀, same data as holotype; 3 ♂♂, 2 ♀♀, same, except KU-39805; 3 ♂♂, 4 ♀♀, same, except 2.VII.1954, KU-61328.

17a. Geomydocrates expansus (Duges) FIG. 37, 43, 59, 79, 108, 145


♂: HW 0.41-0.43 (FIG. 79); temple margin (FIG. 43) with submarginal seta long and situated near outer spiniform marginal seta; scape as in FIG. 145. Abdomen with short to medium tegomeral setae; terminalia as in FIG. 22. TBL 1.24-1.29. Genitalia (FIG. 108) with subtriangular endomterial plate apically bifurcate, parameral arch evenly rounded laterally, and sac with 6 large spines; GW 0.14-0.15.

♀: HW 0.44-0.47 (FIG. 36 or 37); temple margin (FIG. 59) with short submarginal seta. Last tergite as in FIG. 69. Subgenital plate (FIG. 10) with setae as in FIG. 6; tegomeral setae on VII longer than those on VI. TBL 1.21-1.27. Genital chamber particles as in FIG. 65; genital chamber sac (FIG. 93) with numerous anterior loops.

The ♂ is recognized by the antennal type, the temple setae, the dimensions, and the details of the genitalia, including specifically the shape of the endomterial plate and parameral arch, the number of spines in the sac, and the width. The ♀ is identified by the placement and length of the setae on the last tergite, the type of genital chamber sac, the longer tegomeral setae on VII, and the temple setae.

The type-host of G. expansus is a matter of conjecture, since "Geomyms mexicanus" is not an identifiable name and since both hosts mentioned with the description were given most probably as examples of species belonging to the group to which "Tuza" belongs (Hopkins & Clay 1932). With the type-materials unknown, we have selected P. castanops as the host most likely to represent the true type-host of this louse, because it is the most common species of pocket gopher found in the northern region of Mexico. This distribution and the general shape of the louse are the only clues provided by Duges (1902) in the description. Even though we have seen material of G. expansus from only 3 subspecies of P. castanops, ranging from Kansas to Zacatecas, the distribution shown in FIG. 149 encompasses the range of all subspecies, acknowledging that this may be somewhat presumptive.

Material Examined: 10 ♂♂, 25 ♀♀. Pappogeomys castanops castanops, U.S.A., Kansas (3); 5 ♂♂, 5 ♀♀, P. c. lacrimalis (Nelson & Goldman), U.S.A., Texas (3), New Mexico; 1 ♂, 2 ♀♀, P. c. rubellus, Mexico, Zacatecas. Questionable record: 11 ♂♂, 9 ♀♀, P. zinseri, Mexico, Jalisco (2).

17b. Geomydocrates coronadui Barrera FIG. 71


♂: Much as for G. expansus, but terminalia as in FIG. 23; TBL 1.20-1.34; and genitalia (FIG. 153) with endomterial plate narrowed apically.

♀: HW 0.45-0.52 (FIG. 37); temple margin (FIG. 54) with submarginal seta extending near apex of longer marginal seta. Last tergite (FIG. 71) occasionally with 1 seta slightly longer than shown. Subgenital plate as in FIG. 16; tegomeral setae
on VII approximately equal to those on VI. TBL 1.21-1.34. Genital chamber particles apparently as in FIG. 65, possibly as in FIG. 66; genital chamber sac (FIG. 94) with few weak anterior loops.

The 3 is separated from that of G. expansus on the basis of the distinctly narrowed apical portion of the endosomal plate. The 2 is more easily separated, being differentiated from G. expansus by having a genital chamber sac with fewer anterior loops, much shorter setae on the last tergite, and tergocentral setae on VII equal to those on VI.

The description of G. coronadoi clearly represents a composite, the holotype 3 being as described here and from the host, P. m. estor. The 2 allotype, however, is obviously that of another species, represented here by G. perotensis n. sp., also from P. m. estor. Apparently, Barrera (1961) was unaware of the occurrence of 2 different species on the same individual for a number of pocket gophers and had an incorrect association.

Material Examined: 2 3, 2 2, Pappogeomys merriami estor, Mexico, Veracruz (2); 1 2, P. m. perotensis (Merriam), Mexico, Veracruz; 14 3, 15 2, P. m. saccharalis (Nelson & Goldman), Mexico, Puebla (2); 1 3, 1 2, P. merriami, Mexico, Puebla. Questionable record: 3 3, 1 2, P. m. merriami (Thomas), Mexico, Rio Frio.

17c. Geomydous merriami Price & Emerson, n. sp. FIG. 136

Type-host: Pappogeomys merriami merriami (Thomas).

- As for G. expansus, except TBL 1.39-1.40 and GW 0.16-0.17 (FIG. 136).
- As for G. coronadoi, but with subgenital plate (FIG. 24) with setae as in FIG. 25; TBL 1.34-1.37; and genital chamber sac (FIG. 93) with numerous anterior loops.

The 3 is quite close to those of G. expansus, G. coronadoi, and G. veracruzensis n. sp.; it is separable from the first 2 on the basis of the larger genitalia size and possibly on the shape of the genital endomeral plate, and tenuously from the last on larger body size and shape of the endomeral plate. The 2, with the very short lateroposterior setae on the last tergite, is closest to G. coronadoi, G. polydentatus n. sp., and G. veracruzensis; the numerous anterior loops of the genital chamber sac and the absence of a patch of long mediaanterior setae on the subgenital plate separate it from the first 2; differences in lengths of the setae on the last tergite and subgenital plate separate it from the last species.


17d. Geomydous veracruzensis Price & Emerson, n. sp. FIG. 6, 70

Type-host: Pappogeomys merriami fulvescens (Merriam).

- Close to G. expansus, except for TBL 1.28-1.31, and GW 0.17-0.18 (FIG. 105).
- Close to G. coronadoi, but with last tergite (FIG. 70) with outer setae distinctly shorter than other 2; subgenital plate (FIG. 10) with setae as in FIG. 6; and genital chamber sac (FIG. 93) with numerous anterior loops.

The 3 of G. veracruzensis is separated from that of G. merriami only on the basis of differences in total body length and possible differences in genitalic structure. The 2 is likewise close to G. merriami, but with differences in chaetotaxy of the subgenital plate (FIG. 6 vs 25) and of the last tergite (FIG. 70 vs 71).


17e. Geomydous polydentatus Price & Emerson, n. sp. FIG. 25, 72, 93, 137

Type-host: Pappogeomys zinseri (Goldman).

- As for G. expansus, except for HW 0.45-0.47 (FIG. 78); TBL 1.39-1.46; and genitalia (FIG. 137) with 10-11 large spines on sac and GW 0.17-0.18.
- HW 0.61-0.63 (FIG. 35, 36); temple margin as in FIG. 35.
- Last tergite often as in FIG. 72, with middle seta longest, but variably as in FIG. 70. Subgenital plate much as in FIG. 10, but with setae as in FIG. 25; tergocentral setae on VII longer than those on VI. TBL 1.42-1.50. Genital chamber particles as in FIG. 65; genital chamber sac (FIG. 93) large, with lines as shown.

The large number of prominent spines on the genital sac easily separates the 3 of G. polydentatus from all other species, with the possible exception of G. trichopli; however, these 2 species have distinctly different endomeral plates of the genitalia, as well as other differentiating features. The 2, with the very short lateroposterior setae on the last tergite, is close to the preceding 3 species, but the large genital chamber sac and distinctive lines, the greater body length, and the longer tergocentral setae on VII, will characterize G. polydentatus.

Material Examined: Holotype 3, allotype 2, Pappogeomys zinseri, Lagos de Moreno, Jalisco, Mexico, 15.X.1965, KU-103348; in collection of University of Kansas. Paratypes: 6 3, 10 2, same data as holotype; 12 3, 7 2, same, except KU-103347. Questionable records: 2 3, 3 2,
P. tylorhinus brevirostris, Mexico, Guanajuato; 1 ♂, P. alcorni, Mexico, Jalisco.

18a. Geomyodes mexicanus Price & Emerson, n. sp. FIG. 1, 2, 15, 16, 41, 53, 68, 87, 141, 142

Type-host: Pappogeomys merriami saccharalis (Nelson & Goldman).

♂. HW 0.42–0.44; temple margin as in FIG. 41–43; scape as in FIG. 143. Abdomen (FIG. 1) with short tergoventral setae; terminalia as in FIG. 15. TBL 1.13–1.18. Genitalia (FIG. 142) with evenly rounded parameral arch, endosomal plate varying from FIG. 141 to 142, and sac without large spines; GW 0.11.

♀. HW 0.46–0.47 (FIG. 37); temple margin (FIG. 53) with long submarginal setae. Last tergite (FIG. 68) with inner seta shortest. Subgenital plate (FIG. 16) with patch of medioanterior long setae; tergoventral setae (FIG. 2) on VII equal to or slightly longer than those on VI. TBL 1.22–1.26. Genital chamber particles as in FIG. 63; genital chamber sac (FIG. 87) with faint posteriorly converging lines.

The ♂ genitalia are most distinctive, separating G. mexicanus from all other known species but G. perotensis n. sp.; these 2 species are distinguished by the length of the tergoventral setae and by the size of the genitalia. The ♀, with the unusual type of genital chamber particles (FIG. 63) coupled with the type of lateroposterior setae on the last tergite, the small genital chamber sac as in FIG. 87, and the subgenital plate with a patch of medioanterior long setae, may be separated from related species.

Two specimens of P. m. saccharalis from which G. mexicanus was collected also yielded specimens of G. coronadai, as another example of the occurrence of 2 Geomyodes species on the same individual.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys merriami esitor, Las Vegas, Veracruz, Mexico, 4.XI.1946, KU-19338; in collection of University of Kansas. Paratypes: 8 ♂♂, 7 ♀♀; same data as holotype; 3 ♂♂, 3 ♀♀, Altotonga, Veracruz, Mexico, 11.XI.1946, KU-19329. Other material: 8 ♂♂, 1 ♀, P. m. perotensis (Merriam), Mexico, Veracruz.

18c. Geomyodes perotensis irolonis Price & Emerson, n. subsp.

Type-host: Pappogeomys merriami irolonis (Nelson & Goldman).

♂. As for G. p. perotensis, except for HW 0.45–0.46, TBL 1.19–1.24, and GW 0.09–0.10.

♀. As for G. p. perotensis, except for HW 0.53 and TBL 1.39–1.42.

The specimens from P. m. irolonis are recognized to represent a subspecies of G. perotensis, differing from G. p. perotensis on the consistent difference in head width for both sexes.

Material Examined: Holotype ♀, allotype ♂, Pappogeomys merriami irolonis, Apam, Hidalgo, Mexico, 24.VII.1952, KU-46539; in collection of University of Kansas. Paratypes: 1 ♂, 2 ♀♀; same data as holotype.

18b. Geomyodes perotensis perotensis Price & Emerson, n. sp. FIG. 3, 77, 140

Type-host: Pappogeomys merriami estor (Merriam).

♂. HW 0.40–0.43. Abdomen (FIG. 3) with very short tergoventral setae. TBL 1.09–1.18. Genitalia as in FIG. 140; GW 0.09. Otherwise, as for G. mexicanus.

♀. HW 0.43–0.48. Last tergite (FIG. 77) with medioanterior seta displaced from remaining 2 lateroposterior setae. TBL 1.14–1.37. Otherwise, as for G. mexicanus.

The recognition of G. perotensis as distinct from G. mexicanus is based on the ♂ having tergoventral setae much shorter and on the last tergite of the ♀ having longer setae, with 1 displaced medioanteriorly from the others. The ♀ is apparently inseparable from G. fulvescens n. sp., but the ♂♂ of these 2 species have distinctly different genitalia.

This house species is named G. p. perotensis on the basis of Hall & Kelson (1959) placing P. m. estor and P. m. perotensis together as subspecies of Cratogeomys perotensis, apart from C. merriami. All 3 specimens from which G. p. perotensis was taken also had specimens of G. coronadai.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys merriami estor, Las Vegas, Veracruz, Mexico, 4.XI.1946, KU-19338; in collection of University of Kansas. Paratypes: 8 ♂♂, 7 ♀♀; same data as holotype; 3 ♂♂, 3 ♀♀, Altotonga, Veracruz, Mexico, 11.XI.1946, KU-19329. Other material: 8 ♂♂, 1 ♀, P. m. perotensis (Merriam), Mexico, Veracruz.

18d. Geomyodes fulvescens Price & Emerson, n. sp. FIG. 139

Type-host: Pappogeomys merriami fulvescens (Merriam).

♂. HW 0.43–0.46; temple margin as in FIG. 41; scape as in FIG. 143. Abdomen with medium tergoventral setae on II–IV, short on V–VII; terminalia as in FIG. 15. TBL 1.11–1.12. Genitalia (FIG. 139) with diamond-shaped endosomal plate apically undivided, parameral arch as shown, and small sac without large spines; GW 0.09–0.10.

♀. HW 0.48–0.52 (FIG. 36); temple margin as in FIG. 53. Last tergite as in FIG. 77. Subgenital plate (FIG. 24) with some long medioanterior setae; tergoventral setae on VII about equal to those on VI. TBL 1.29–1.36. Genital chamber particles as in FIG. 63; genital chamber sac as in FIG. 87.

The ♂ genitalia are distinctively different from those of all other known species. The ♀, however, is apparently indistinguishable from those of G. p. perotensis and G. p. irolonis.

The single host specimen from which material of G. fulvescens was taken also was the source of the material for G. veracruzensis.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys merriami fulvescens, Limon, Veracruz,
Mexico, 19 XI 1946, KU-19351; in collection of University of Kansas. Paratypes: 9 ♂♂, 12 ♀♀, same data as holotype.

18e. Geomydoscus traubi Price & Emerson, n. sp. FIG. 23, 24, 63, 75, 80, 138

Type-host: Pappogeomys merriami merriami (Thom- as).

♂. HW 0.44–0.46; temple margin as in FIG. 41–43; scape as in FIG. 145. Abdomen (FIG. 1) with short tergocentral setae; terminalia as in FIG. 23. TBL 1.19–1.29. Genitalia (FIG. 138) with elongate tapered endomeral plate with evidence of apical division, parameral arch as shown, and sac with 2 spines; GW 0.13–0.14.

♀. HW 0.49–0.54 (FIG. 35); temple margin as in FIG. 53. Last tergite (FIG. 75) with medioanterior setae displaced toward midline and much shorter than lateroposterior setae. Subgenital plate (FIG. 24) with number of long medioanterior setae; tergocentral setae on VII slightly longer than those on VI (FIG. 2). TBL 1.36–1.39. Genital chamber particles as in FIG. 63; genital chamber sac (FIG. 80) with lines anteriorly bending laterally.

The ♂ genitalia, with the shape of the endomeral plate and parameral arch and sac with only 2 spines, separate G. traubi from all other known species. The ♀ likewise is easily separated from the other species by having the medioanterior setae of the last tergite so much shorter and finer than the lateroposterior setae.

Three of the same host individuals had specimens of both G. merriami and G. traubi on them.

Material Examined: Holotype ♂, allotype ♀, Pappogeomys merriami merriami, Rio Frio, Mexico, 23 IX 1946, KU-19327; in collection of University of Kansas. Paratypes: 17 ♂♂, 18 ♀♀, same data as holotype; 11 ♂♂, 10 ♀♀, La Piedra, Lagunas de Zempoala, Mexico, 26 III 1963, B-64793; 9 ♂♂, 1 ♀, Toluca, Nevada de Toluca, Mexico, 10 III 1963, B-64451; 4 ♂♂, 1 ♀, Raices, Nevada de Toluca, Mexico, 22 III 1963, B-64691.

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LITERATURE CITED


